Stages in the life of a mine

1. Precursors to mining
    - Prospecting
    - Exploration
    - Mineral resources
    - Ore reserves estimation

2. Mining proper

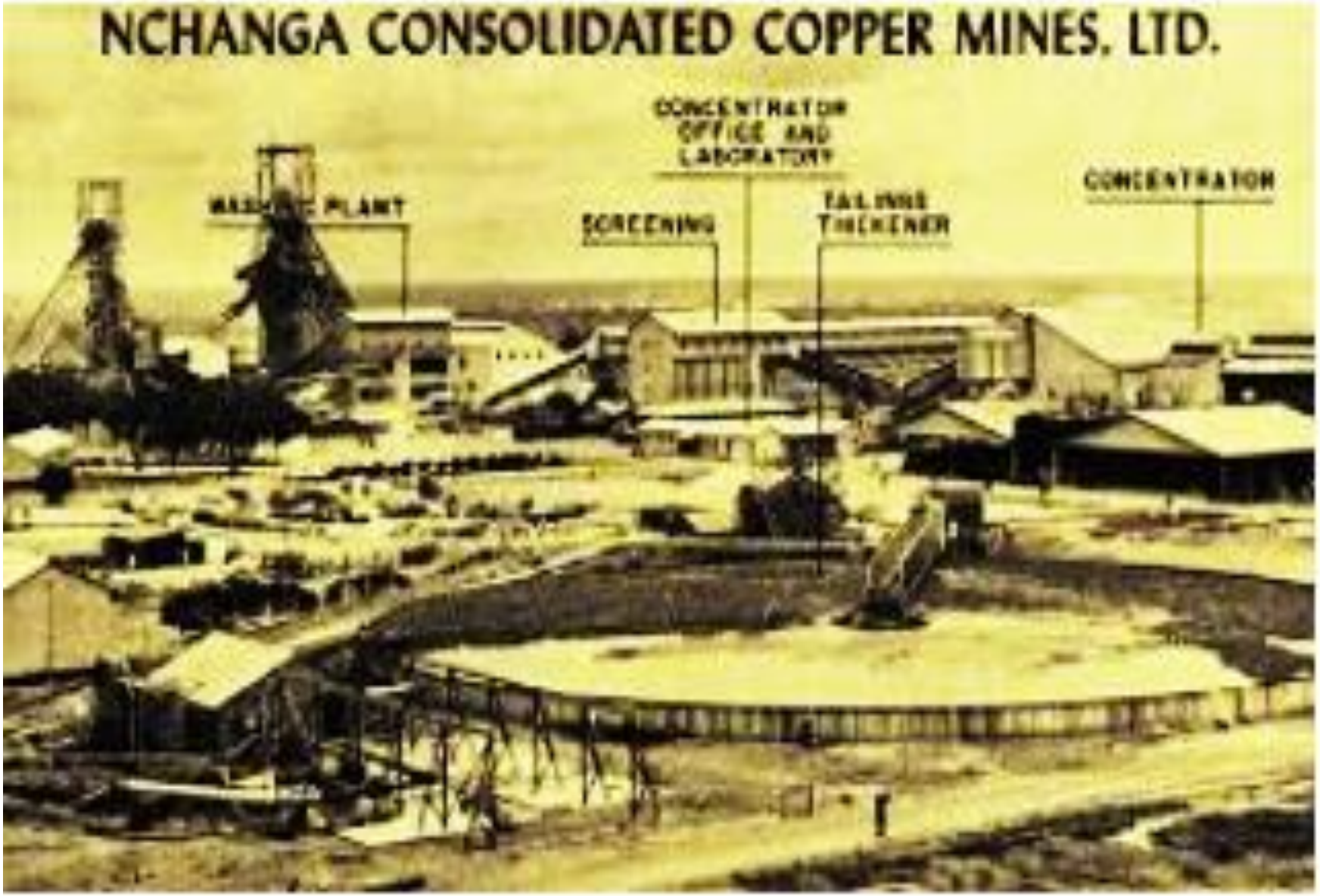
Mining Proper – Process of ore extraction

1. Mine layout
2. Mining techniques or mining methods
   * Factors considered
   * Classification of mining methods
   * Selection of mining techniques
3. *Surface mining*
4. *Underground mining*

MINE LAYOUT

Before mining proper commences, there is need to determine and plan the locations (in relation to the ore body) of:

- Shafts
- Processing plants (Concentrator, Smelter, Refinery)
- Effluent (dam)
- Mine waste disposal sites (dumps)
- Offices and workshops
- Road network, and
- Other operation sites


NCHANGA CONSOLIDATED COPPER MINES, LTD.
CONCENTRATOR OFFICE AND LABORATORY
CONCENTRATION
SCREENING
TAILINGS THICKENER

Mine aerial view

Mining Technique or Mining Method

- Mode of extraction of ore
- Process of removing ore from in-situ
- Application of a systematic approach:
  - Open pit or stope planning and designing
  - Rock fragmentation - mechanical (drilling and blasting)
  - Systems of materials handling (including transportation of ore)

Different ore body configuration requires different mining method or technique therefore need for classification of mining methods

- The classification of the mining methods depends on the feasibility studies.
- The prospecting and exploration of mineral deposit culminates in detailed feasibility studies report.

Factors Considered in Classification of Mining Methods

1. General information – location, accessibility, climate, topography, land status
2. Legal factors
3. Economic factors
4. Technological factors
5. Geological factors

Factors Considered in Classification of Mining Methods

6. Environmental concerns
7. Mineral reserves
8. Processing
9. Auxiliary and support facilities; and
10. Social-political aspects

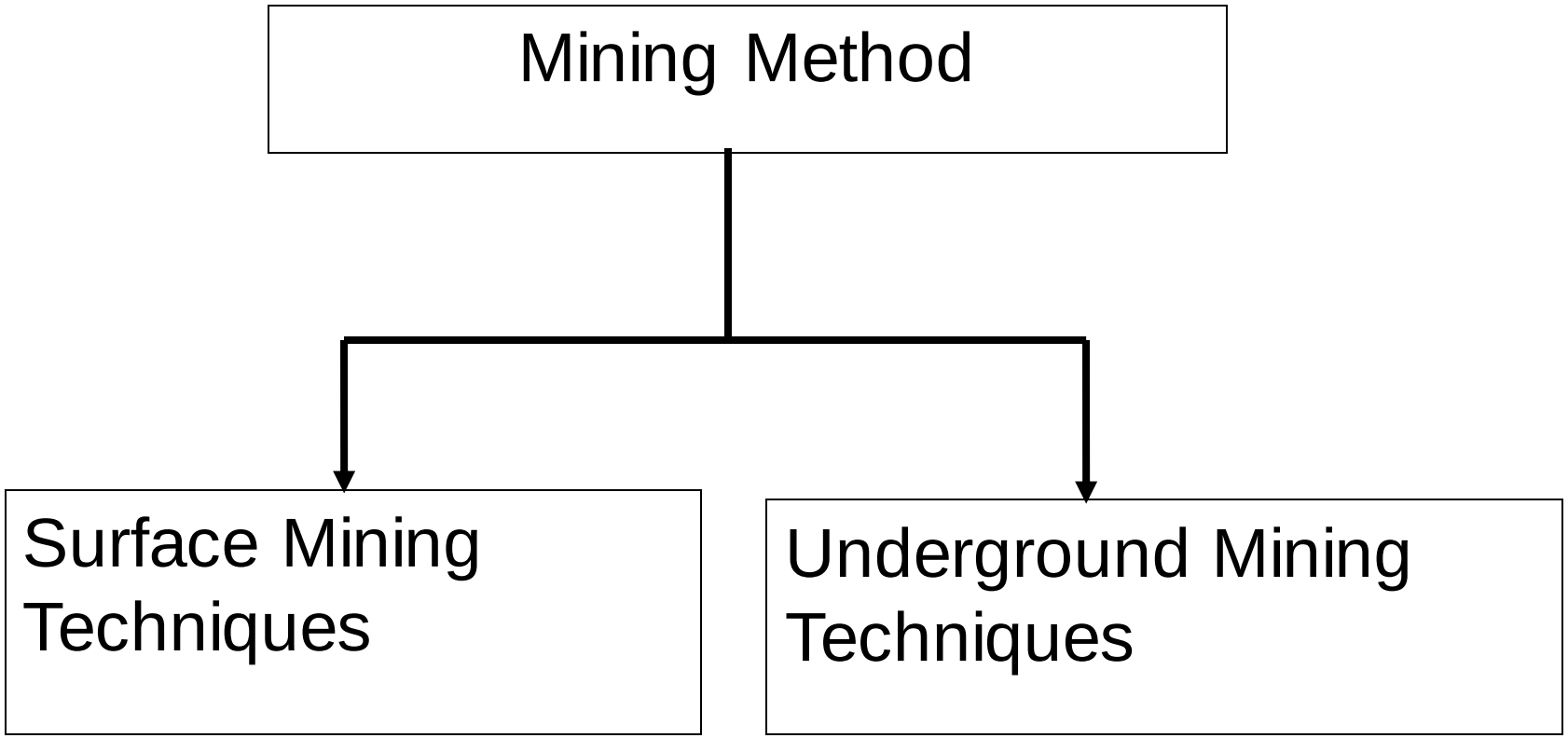
Classification of Mining Methods

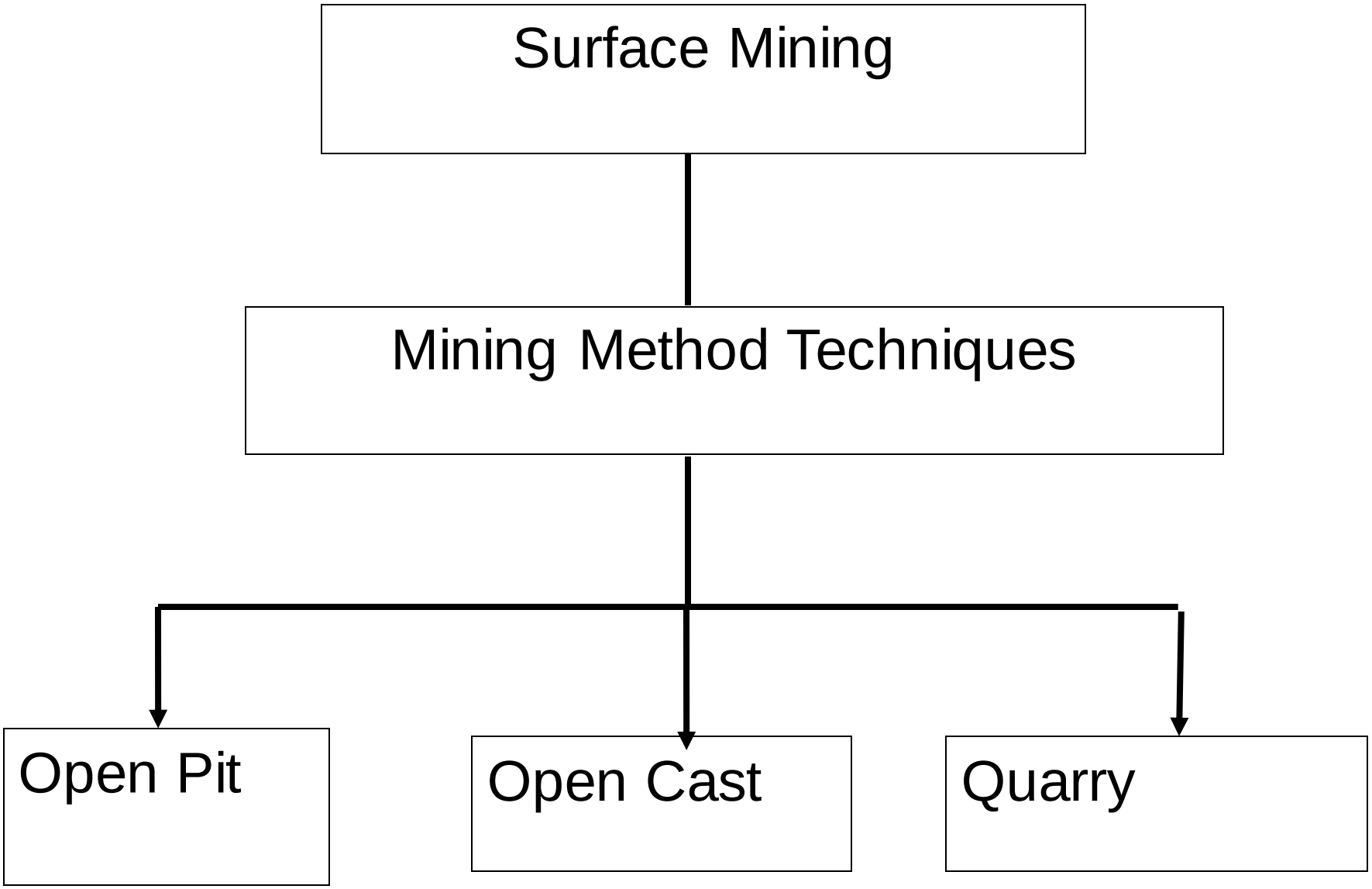
Based on feasibility studies, a mining method is selected for a particular ore-body

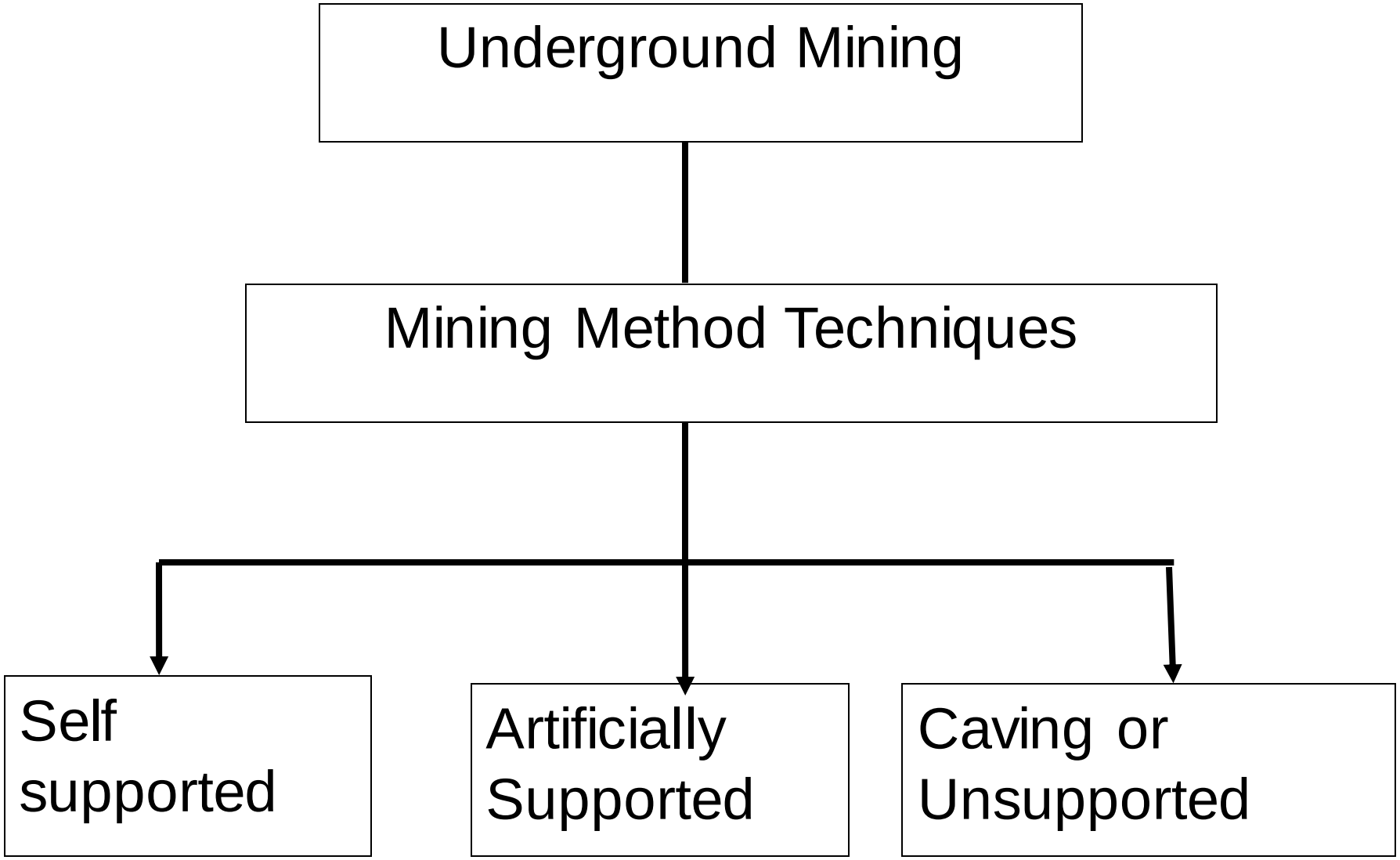
The mining methods are generically classified as:

1. Surface mining; and
2. Underground mining

Classification of Mining Method




Surface Mining
Mining Method Techniques
Open Pit
Open Cast
Quarry


Underground Mining
Mining Method Techniques
Self supported
Artificially Supported
Caving or Unsupported

The factors considered in determining surface or underground mining method include:

1. Spatial characteristics of deposit / ore body
   - Depth
   - Size
   - Shape
   - Attitude (dip)
2. Mining technology
3. Type of mining equipment available
4. Systems of materials handling
5. Production rate
6. Cost effectiveness
7. Safety and environmental controls

Selection of Mining Technique

The factors considered in the selection of the mining technique include:

1. Spatial characteristics of deposit
2. Geologic and hydrologic conditions
   - Ore and country rock
3. Geotechnical properties
   - Ore and country rock
4. Economic considerations
5. Technological
6. Environmental

Mining Techniques

The mining technique to be employed depends on the type of the mineral deposit of the ore-body.

There six main types of mineral deposits:

1. Massive – considerable lateral and vertical extent (mainly of copper ore and dome salt)
2. Bedded or tabular – lateral extensive and parallels the stratification mostly in sedimentary rock (coal measures and potash)

3. Narrow vein – a zone or belt of mineralization (ore) typically long, narrow (<3.0m) and dipping steeply (gold and metallic minerals)

4. Wide vein – some as narrow vein but the vein thickness is greater than 3.0m

5. Lenticular or Pocket – an isolated ore body, limited vertical and horizontal extent in massive (lead, zinc and iron ores)

6. Placer – a surface or near-surface deposit, usually tabular and of considerable areal extent (mainly of gold and platinum)

Images of surface mining:

Images of underground mining


www.miningindustrialphotographer.com


08092

Revision Questions

1. There are a number of factors considered in the classification of mining methods, explain how the following affect the classification
   a) Geological factors
   b) Mineral reserves
   c) Economical factors

2. Describe three advantages and three disadvantages of surface mining compared to underground mining

3. Explain five factors which determine the selection of underground mining

Hypothetical mine

a) With reference to the ore-body below, calculate the dip, the strike length and the tonnage, given SG of 2.3 and thickness of 52m
b) Propose the mining technique giving reasons for your proposal for this hypothetical ore-body
c) Describe factors to be considered before mining this hypothetical ore-body
d) Explain the sequence of activities to extract the ore

Hypothetical mine project